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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/629,806

07/30/2003

Miwa Kozawa

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10/16/2007

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EXAMINER

LEE, SIN J

ART UNIT

PAPER NUMBER

1795

MAIL DATE

DELIVERY MODE

10/16/2007

PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/629,806	Applicant(s) KOZAWA ET AL.	
	Examiner Sin J. Lee	Art Unit 1795	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 31 July 2007.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1,2,4,9 and 12-26 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 13 is/are allowed.
- 6) ☒ Claim(s) 1,2,4,9,12 and 14-21 is/are rejected.
- 7) ☒ Claim(s) 22-26 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 30 July 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

1. Applicants canceled claims 3, 5-8, 10 and 11.
2. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Claim Rejections - 35 USC § 102

3. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.
4. Claims 1, 2, 4, 9, 12 and 14-21 are rejected under 35 U.S.C. 102(e) as being anticipated by Kanda et al (US 6,555,607 B1).

In Example 1, Kanda teaches a water-soluble resin composition (which is used in producing semiconductor devices) which contains *polyvinyl alcohol* (as a water soluble resin), methoxy methylated melamine (a crosslinking agent as well as *an amine compound*), 2,4,7,9-tetramethyl-5-decyne-4,7-diol polyethoxylate (present primary alcohol ethoxylate compound, present alkoxylate surfactant, and present alcohol

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surfactant), water and isopropyl alcohol (present alcohol solvent). Kanda applies his water-soluble resin composition onto a resist pattern (which is formed onto a silicon wafer) to prepare a water-soluble resin coating and then the contact hole resist pattern is formed (see Example 2). Therefore, Kanda teaches present inventions of claims 1-4, 8, 9 and 14-21.

With respect to present claim 12, Kanda teaches that combination of two or more water soluble resins can be used in his composition and as one of example for suitable water soluble resin, Kanda includes styrene-maleic anhydride copolymer (see col.2, lines 35-53). Based on this teaching, one skilled in the art would readily envisage using styrene-maleic acid copolymer in addition to the polyvinyl alcohol in Kanda's Example 1 as his water soluble resins. Therefore, the prior art teaches present invention of claim 12.

Claim Rejections - 35 USC § 103

5. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

6. Claims 1, 2, 4, 9, 12 and 14-21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ishibashi et al (US 6,579,657 B1) in view of Mizutani et al (US 2002/0015909 A1) or Yasunami et al (US 2002/0028409 A1).

In col.2, lines 38-57, Ishibashi teaches a method for manufacturing a semiconductor device: A first resist pattern is formed from a first resist (a mixture of novolac resin and a naphthoquinonediazide photosensitive agent) on a semiconductor base layer. A second resist is formed on the first resist pattern which generates

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crosslinking reaction in the presence of an acid. A crosslinked film is formed at a portion of the second resist contacting with the first resist pattern by the agency of an acid fed from the first resist pattern. Non-crosslinked portions of the second resist are removed (i.e., developed) to form a second resist pattern. Finally, the semiconductor base layer is subjected to etching through the second resist pattern used as a mask.

Specifically, in his Example 11, Ishibashi teaches a second resist (which is used as a resist pattern thickening material) which contains *polyvinyl acetal* (a water-soluble resin), (N-methoxymethyl)methoxyethyleneurea (a crosslinking agent), (N-methoxymethyl) hydroxyethyleneurea (a crosslinking agent), *N-methoxymethylurea* (a crosslinking agent) and *pure water*. N-methoxymethylurea ($\text{NH}_2\text{-C(=O)-N(H)-CH}_2\text{OCH}_3$) also teaches present nitrogen-containing compound. Ishibashi teaches (col.7, lines 54-61) the equivalence of urea crosslinking agents and melamine or amino crosslinking agents. Thus, it would have been obvious to one skilled in the art to use a melamine or amino crosslinking agent in Ishibashi's Example 11 with a reasonable expectation of reducing the hole-diameter of a resist pattern.

Ishibashi also teaches (col.9, line 6-12) that in order to improve the film-forming properties, surface active agents such as non-ionic *polyoxyethylene nonylphenyl ether type surfactant* can be added to the second resist material. Even though polyoxyethylene nonylphenyl ether are not listed in present claims, polyoxyethylene nonylphenyl ether and presently recited compounds such as polyoxyethylene alkyl ether (which is also a polyoxyalkylene alkylether compound), polyoxyethylene-polyoxypropylene condensation product, sorbitan fatty acid ester compound (which is

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also a fatty acid ester surfactant) are all well known in the art as non-ionic surfactants that are used in photoresist art in order to improve coating ability as evidenced by Mizutani, [0125]-[0126] or Yasunami, [0226]. Because all of those surfactants listed above were known in the art as surfactants that are used in the art of photoresist in order to improve film-forming properties or coating ability at the time the invention was made, it would have been obvious to one skilled in the art to use polyoxyethylene alkyl ether, polyoxyethylene-polyoxypropylene condensation product or sorbitan fatty acid ester compound as Ishibashi's non-ionic surfactant with a reasonable expectation of improving film-forming properties of his second resist material. Thus, Ishibashi in view of Mizutani or Yasunami would render present inventions of claims 1, 2, 4, 9 and 16-21.

With respect to present claim 12, Ishibashi teaches that his water-soluble resin (which examples include polyvinylacetal as well as styrene-maleic acid copolymer) for the second resist can be used singly or in combination of two or more. Based on this teaching, one skilled in the art would readily envisage using styrene-maleic acid copolymer in addition to the polyvinyl acetal in Ishibashi's Example 11 as his water soluble resins. Therefore, Ishibashi in view of Mizutani or Yasunami would render obvious present invention of claim 12.

With respect to present claims 14 and 15, Ishibashi teaches (col.9, lines 14-22) that the solvents for the second resist may be water and alcoholic solvents such as isopropyl alcohol. Therefore, Ishibashi in view of Mizutani or Yasunami would render obvious present inventions of claims 14 and 15.

Allowable Subject Matter

7. Claim 13 is allowed. None of the cited prior arts teaches or suggests present second resin of claim 13. Claims 22-26 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. None of the cited prior arts teaches or suggests present imide or quaternary ammonium compound of claims 22-26.

Response to Arguments

8. Applicants argue that claims 1, 16, 17, 20 and 21 are not anticipated by Kanda'607 because Kanda's methoxy methylated melamine does not correspond to any of the claimed amine, amide, imide and quaternary ammonium. However, a melamine is still an amine compound; see for example, Iwasaki et al (4,423,091), col.4, lines 30-31 or Santos et al (4,480,068), col.3, lines 53-56. Thus, Kanda still teaches present inventions of claims 1, 16, 17, 20 and 21.

Applicants argue that neither Mizutani nor Yasunami teaches the equivalency of the polyoxyethylene nonylphenyl ether, polyoxyethylene alkyl ether, polyoxyethylene-polyoxypropylene condensation product, sorbitan fatty acid ester compound. However, as discussed above, those two references are being cited in order to support the Examiner's position that those non-ionic surfactants were already known in the art (at the time the invention was made) as surfactants, which are used in the art of photoresist in order to improve film-forming property or coating ability. Therefore, in the absence of showing unexpectedly superior results of present invention, it is still the Examiner's position that it would have been obvious to one skilled in the art to use polyoxyethylene

alkyl ether, polyoxyethylene-polyoxypropylene condensation product or sorbitan fatty acid ester compound as Ishibashi's non-ionic surfactant with a reasonable expectation of improving film-forming properties of his second resist material.

Applicants argue that in those references cited by the Examiner, those surfactants are being used to improve the film forming property whereas in the present invention, the object of adding a surfactant is to improve the affinity between the resist pattern thickening material and a resist pattern. However, (even if one were to see those two objects as unrelated,) while there must be motivation to make the claimed invention, there is no requirement that the prior art provide the same reason as the applicant to make the claimed invention. See MPEP 2144.

Applicants argue that it is a mere speculation to think that there is a reasonable expectation that the nonionic surfactants of Mizutani or Yasunami would improve film-forming properties in Ishibashi and that none of the cited references provides any suggestion that those surfactants of Mizutani or Yasunami would improve film-forming properties of Ishibashi's second resist. Applicants argue that the invention of Mizutani and Yasunami is different from Ishibashi's invention and that one skilled in the art would not consider that the nonionic surfactants of Mizutani or Yasunami are suitably used for Ishibashi's second resist. The Examiner disagrees. As addressed above, polyoxyethylene nonylphenyl ether and presently recited compounds (such as polyoxyethylene alkyl ether, polyoxyethylene-polyoxypropylene condensation product, sorbitan fatty acid ester compound) were all well known in the art (at the time the invention was made) as non-ionic surfactants that are used in photoresist art with the

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purpose of improving a coating ability (which is the same as a film-forming property), as evidenced by Mizutani or Yasunami. Because both polyoxyethylene nonylphenyl ether and those surfactants listed in the references are all used in the photoresist art with the same purpose of improving coating property or film-forming property, it would have been obvious to one skilled in the art (in the absence of showing unexpectedly superior results) to use polyoxyethylene alkyl ether, polyoxyethylene-polyoxypropylene condensation product or sorbitan fatty acid ester compound as Ishibashi's non-ionic surfactant with a *reasonable expectation* of improving film-forming properties of his second resist material. Applicants also point out that examples of Ishibashi do not actually include any surfactants. However, Ishibashi clearly teaches in col.9, lines 6-12 that in order to improve the film-forming properties, surfactants (such as non-ionic polyoxyethylene nonylphenyl ether type surfactant) can be added to the second resist material. Furthermore, in In re Mills and Palmer 176 USPQ 196, it was held that non-preferred embodiments cannot be ignored, and even if the non-preferred embodiments are used, obviousness exists. Patentee, in the same manner as applicant, is not limited in his teachings to only the exemplified subject matter.

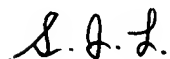
For those reasons explained above, present 103(a) rejection over Ishibashi in view of Mizutani or Yasunami still stands.

9. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Sin J. Lee whose telephone number is 571-272-1333. The examiner can normally be reached on Monday-Friday from 9:00 am EST to 5:30 pm EST.

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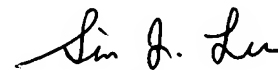
If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Cynthia Kelly, can be reached on 571-272-1526. The fax phone number for the organization where this application or proceeding is assigned is **571-273-8300**.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



S. Lee

October 11, 2007



SIN LEE
PRIMARY EXAMINER